

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN 435.

Experiment Station Work, LXII.

Compiled from the Publications of the Agricultural Experiment Stations.

WATER REQUIRED FOR CROPS.
BURNING LIME ON THE FARM.
TOMATOES FOR CANNING.
LIME SULPHUR AS A FUNGICIDE.

MARKET CLASSES AND GRADES OF
MEAT.
LICE ON POULTRY.
NEUFCHATEL CHEESE.

JANUARY, 1911.

PREPARED IN THE OFFICE OF EXPERIMENT STATIONS.

A. C. TRUE, Director.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1911.

THE AGRICULTURAL EXPERIMENT STATIONS.

ALABAMA—

College Station: *Auburn*; J. F. Duggar.^a
Canebrake Station: *Uniontown*; F. D. Stevens.^a
Tuskegee Station: *Tuskegee Institute*; G. W. Carver.^a

ALASKA—*Sitka*; C. C. Georgeson.^b

ARIZONA—*Tucson*; R. H. Forbes.^a

ARKANSAS—*Fayetteville*; C. F. Adams.^a

CALIFORNIA—*Berkeley*; E. J. Wickson.^a

COLORADO—*Fort Collins*; C. P. Gillette.^a

CONNECTICUT—

State Station: *New Haven*; E. H. Jenkins.^a

Storrs Station: *Storrs*; L. A. Clinton.^a

DELAWARE—*Newark*; H. Hayward.^a

FLORIDA—*Gainesville*; P. H. Rolfs.^a

GEORGIA—*Experiment*; Martin V. Calvin.^a

GUAM—*Island of Guam*; J. B. Thompson.^b

HAWAII—

Federal Station: *Honolulu*; E. V. Wilcox.^b

Sugar Planters' Station: *Honolulu*; C. F. Eckart.^a

IDAHO—*Moscow*; W. L. Carlyle.^a

ILLINOIS—*Urbana*; E. Davenport.^a

INDIANA—*La Fayette*; A. Goss.^a

IOWA—*Ames*; C. F. Curtiss.^a

KANSAS—*Manhattan*; E. H. Webster.^a

KENTUCKY—*Lexington*; M. A. Scovell.^a

LOUISIANA—

State Station: *Baton Rouge*;

Sugar Station: *Audubon Park*,

New Orleans;

North La. Station: *Calhoun*;

Rice Station: *Crowley*;

W. R. Dodson.^a

MAINE—*Orono*; C. D. Woods.^a

MARYLAND—*College Park*; H. J. Patterson.^a

MASSACHUSETTS—*Amherst*; W. P. Brooks.^a

MICHIGAN—*East Lansing*; R. S. Shaw.^a

MINNESOTA—*University Farm, St. Paul*; A. F. Woods.^a

MISSISSIPPI—*Agricultural College*; J. W. Fox.^a

^a Director.

^b Special agent in charge.

^c Acting director.

MISSOURI—

College Station: *Columbia*; F. B. Mumford.^a

Fruit Station: *Mountain Grove*; Paul Evans.^a

MONTANA—*Bozeman*; F. B. Linfield.^a

NEBRASKA—*Lincoln*; E. A. Burnett.^a

NEVADA—*Reno*; J. E. Stubbs.^a

NEW HAMPSHIRE—*Durham*; J. C. Kendall.^a

NEW JERSEY—*New Brunswick*; W. H. S. Demarest.^c

NEW MEXICO—*Agricultural College*; Luther Foster.^a

NEW YORK—

State Station: *Geneva*; W. H. Jordan.^a

Cornell Station: *Ithaca*; L. H. Bailey.^a

NORTH CAROLINA—

College Station: *West Raleigh*; C. B. Williams.^a

State Station: *Raleigh*; B. W. Kilgore.^a

NORTH DAKOTA—*Agricultural College*; J. H. Worst.^a

OHIO—*Wooster*; C. E. Thorne.^a

OKLAHOMA—*Stillwater*; J. A. Wilson.^a

OREGON—*Corvallis*; J. Withycombe.^a

PENNSYLVANIA—

State College: T. F. Hunt.^a

State College: Institute of Animal Nutrition,
H. P. Armsby.^a

PORTO RICO—*Mayaguez*; D. W. May.^b

RHODE ISLAND—*Kingston*; H. J. Wheeler.^a

SOUTH CAROLINA—*Clemson College*; J. N. Harper.^a

SOUTH DAKOTA—*Brookings*; J. W. Wilson.^a

TENNESSEE—*Knoxville*; H. A. Morgan.^a

TEXAS—*College Station*; H. H. Harrington.^a

UTAH—*Logan*; E. D. Ball.^a

VERMONT—*Burlington*; J. L. Hills.^a

VIRGINIA—

Blacksburg; S. W. Fletcher.^a

Norfolk: Truck Station, T. C. Johnson.^a

WASHINGTON—*Pullman*; R. W. Thatcher.^a

WEST VIRGINIA—*Morgantown*; J. H. Stewart.^a

WISCONSIN—*Madison*; H. L. Russell.^a

WYOMING—*Laramie*; H. G. Knight.^a

EXPERIMENT STATION WORK.

Edited by W. H. BEAL and the Staff of the Experiment Station Record.

Experiment Station Work is a subseries of brief popular bulletins compiled from the published reports of the agricultural experiment stations and kindred institutions in this and other countries. The chief object of these publications is to disseminate throughout the country information regarding experiments at the different experiment stations, and thus to acquaint farmers in a general way with the progress of agricultural investigation on its practical side. The results herein reported should for the most part be regarded as tentative and suggestive rather than conclusive. Further experiments may modify them, and experience alone can show how far they will be useful in actual practice. The work of the stations must not be depended upon to produce "rules for farming." How to apply the results of experiments to his own conditions will ever remain the problem of the individual farmer.—A. C. TRUE, Director, Office of Experiment Stations.

CONTENTS OF NO. LXII.

	Page.
Water required for crops on rich and poor soils.....	5
Burning lime on the farm.....	6
Growing tomatoes for the canning factory.....	8
Lime sulphur as a fungicide.....	12
Market classes and grades of meat.....	16
Beef.....	16
Veal.....	18
Mutton and lamb.....	19
Pork.....	19
Keeping poultry free from lice.....	20
Neufchatel cheese.....	21

ILLUSTRATIONS.

	Page.
FIG. 1. Details of construction of a farm limekiln.....	7
2. Section showing the construction of a hotbed for tomato plants.....	9
3. Cuts of beef.....	17
4. Cuts of veal.....	18
5. Cuts of mutton and lamb.....	18
6. Cuts of pork.....	19

EXPERIMENT STATION WORK.^a

WATER REQUIRED FOR CROPS ON RICH AND POOR SOILS.^b

A fact of immense importance, especially in regions of scanty rainfall, or those subject to severe droughts, has been brought out by investigations reported by J. A. Widtsoe, of the Utah Station, as well as by the work of other investigators. Prof. Widtsoe found "that the amount of water actually required for the production of a pound of dry matter becomes smaller as the available fertility of the soil increases." He states that "this law is not new, but it does not seem to have been applied to the cultural methods in a country where the limiting factor is the water supply."

Prof. Widtsoe found that thorough hoeing or cultivation throughout the season increased materially the yield of dry matter and decreased the amount of water required per pound of dry matter produced, that resting the soil for several years had the same effect, and that on infertile soils the water requirements of crops could be materially lowered by the addition of manure or commercial fertilizers. He believes that in every case the result is to be attributed largely to the plant food set free by the hoeing or fallowing or that added in the fertilizers.

The practical conclusion of all this is simply that, in districts where the rainfall is the chief consideration, it is not sufficient alone to store an abundance of water in the soil, but the soils themselves must be kept in such a condition that plants growing on them can produce dry matter with the smallest possible amount of water. Under a system of dry-farm rotation in which a hoed crop is grown perhaps every other year, in alternation with wheat, a fairly large amount of available plant food will be maintained, but at the same time the amount of stored moisture will be so near the danger limit as to jeopardize seriously the maturing crop. On the other hand, where the soil after being fall plowed and left in the rough throughout the winter is allowed to lie fallow the following summer, a much larger amount of plant food is set free, and at the same time a larger amount of water is stored in the soil. This combination of favorable conditions is much more likely to result in a profitable yield than

^a A progress record of experimental inquiries, published without assumption of responsibility by the Department for the correctness of the facts and conclusions reported by the stations.

^b Compiled from Utah Sta. Bul. 105.

can any system of culture which tends to weaken one or the other of these vitally important factors. In the Great Basin district, practical experience has demonstrated almost beyond a doubt that summer fallowing is indispensable in successful dry farming. In fact, it has become a doctrine that if land at all adapted to dry farming is summer fallowed every other year a crop failure for want of water is impossible.

Dry farming lands are fallowed: First, to store in the soil the precipitation of two or more years; and secondly, to set free plant food which will enable the crops to reach maturity with the smallest amount of water. This doctrine explains, undoubtedly, many of the successes and failures on dry farms. Numerous cases are on record where soils under a comparatively abundant rainfall failed to yield well, while other soils under a much smaller rainfall yielded abundantly. There are many soils the available fertility of which is so low that they must be carefully cultivated in order to set free sufficient plant food before successful dry farming can be practiced upon them. This is shown in lands that are allowed to lie fallow for a year after the first plowing before crops are planted. The extraordinary yields sometimes obtained on soils where the rainfall is 12 inches or less may be explained by the naturally large quantity of available plant food found in them.

The understanding of the relationship between soil fertility and transpiration is vital to dry farming, but it is also important to irrigation farming, especially in districts where the water supply is limited. If the irrigation farmer, either by fallowing or by proper manuring, maintains his land in a fertile condition, he will better meet seasons of drought or water shortage than his neighbor whose lands are in an unfertile condition. The principle here discussed must be incorporated into the practice of agriculture in arid regions.

In the Utah experiments it was found that corn required a third less water to mature a pound of dry matter on soil which had been manured or fertilized with nitrate of soda than on the same soil without such treatment.

The important lesson from this work, briefly stated, is that if the farmer wishes to conserve a scanty water supply and use it to the best advantage in the growth of crops he must keep his land rich.

BURNING LIME ON THE FARM.^a

In a bulletin of the Virginia Experiment Station, dealing very fully with the question of the liming of soils, W. B. Ellett says:

Many farms are situated long distances from railroads, and the hauling of lime is expensive. Even if the ground limestone is available at prices ranging from \$1 to \$1.75 [per ton] it would probably be more economical in many cases for farmers to burn their own lime, if good limestone is on or near the farm, thus utilizing their labor to advantage during the winter months. Many farmers in the western section of the State [Virginia] are now burning their own lime, and producing it at a cost of 7 to 9 cents a bushel, instead of 12 cents, the average price of lime from the manufacturer. Cheap coal or wood as well as good limestone are essential to the success of home burning. The rock should "quarry out" easily; that is, it should come out in strata or layers. It should analyze at least 90 per cent of carbonate of lime.

^a Compiled from Virginia Sta. Bul. 187.

A suitable location near the quarry is chosen, preferably the side of a hill. An excavation is made 10 feet into the hill, and to a depth of 7 feet. [Fig. 1.] The width of the kiln is 8 feet at its greatest breadth, sloping gently at the bottom. A trench 18 inches wide and 1 foot deep is dug through the center, at the base of the kiln. Across the trench are placed pieces of old castings, which serve the purpose of a grate. The front and side walls of the kiln are built like a retaining wall. The rear walls are sometimes built of rock, but usually no wall is built, as the sides of the hill answer this purpose. The general plan of the kiln is oval, both at the base and top.

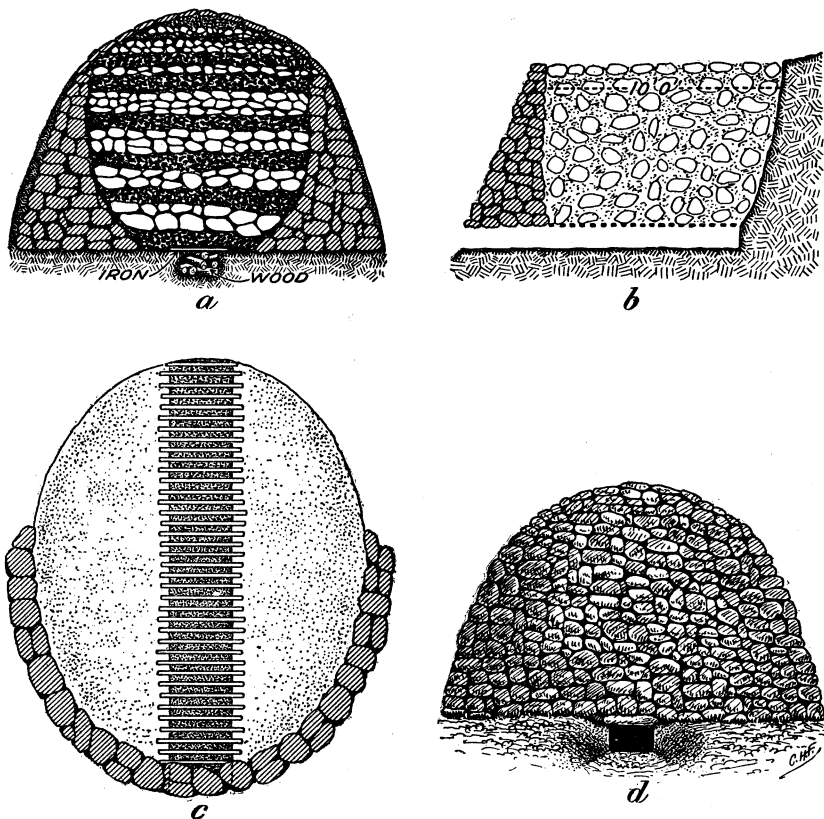


FIG. 1.—Details of construction of a farm limekiln: *a*, Cross section, showing layers of rock and coal; *b*, longitudinal section, showing side hill used as back wall; *c*, ground plan, showing trench and grate; *d*, completed kiln, walled in and plastered with mud.

Over the grate in the center of the kiln, at the bottom, is placed a layer of coal of sufficient size not to pass through the openings. On top of this layer of coal is placed the limestone rock, which may vary in size from 6 to 12 inches in diameter. Alternate layers of fine coal and rock are now introduced, and this is continued until the kiln is filled, leaving an opening in the rear, at the top, large enough to serve the purpose of a flue. When the kiln has been filled, it is covered with a layer of flat rocks and the front is then inclosed with rock and sealed with mud. In the trench at the bottom of the kiln enough wood is introduced to set fire to the coal. The burning is continued for from 2 to 3 days, with 3 to 5 days for cooling.

A kiln of these dimensions will furnish from 250 to 300 bushels of stone lime at each charge. The amount of coal used to a charge is 100 bushels to 300 bushels of rock. If much magnesia, silica, and alumina are present in the limestone, it fuses readily, and in such cases care must be taken to keep the temperature below the melting point, so as to prevent the formation of slag, and the making of "dead-burnt" or "overburnt" lime.

To build and operate the kiln requires the services of one man from 8 to 10 days, at a cost of about \$1.50 per day. The coal used varies in amount with the rock, but usually 1 bushel of coal is used to 3 of limestone; and in a kiln of this size 100 bushels of coal is used with 300 bushels of limestone rock.

An average charge against the kiln would be:

1 man for 10 days, at \$1.50_____	\$15. 00
100 bushels coal, at 7½ cents._____	7. 50
Wood for igniting the charge_____	. 50
Total_____	23. 00

The yield of good stone lime should be 250 bushels. This would make a ton of lime cost the farmer \$2.25, or a fraction above 9 cents for a bushel. This price would be considerably less than the farmer would have to pay for lime from a dealer.

GROWING TOMATOES FOR THE CANNING FACTORY.^a

The annual pack of tomatoes in the United States is probably not less than 10,000,000 cases. The growing of tomatoes for canning is therefore an important agricultural industry. A large part of the crop for this purpose is grown by the general farmer rather than by a specialist, and as a rule not as much care is taken with it as is necessary to yield the greatest profit.

A bulletin of the Indiana Experiment Station, by J. Troop, C. G. Woodbury, and J. G. Boyle, summarizes the results of a study of tomato growing for canning in Indiana, and on the basis of the observations so made calls attention to some of the weak points in present methods of producing canning tomatoes, particularly as applied to practice in Indiana, but also applicable in large measure to other parts of the country. It is pointed out that it is especially necessary that greater care should be exercised in growing the young plants, and that millions of inferior plants are now set, either as the result of poor seed or unskillful growing, reducing greatly the yield and profit from the crop. It was also found that as a rule the soil was not prepared as thoroughly as it should be, and that more time, labor, and money might profitably be given to drainage and fertilizing. "Thousands of farmers are failing in growing tomatoes because they do not realize the soil and cultural requirements of the plant." The necessity for constant and thorough cultivation is not fully recognized. "It is probable that neglect of cultivation is responsible for a greater proportion of unprofitable tomato yields than any other single factor entering into the production of the crop."

^a Compiled from Indiana Sta. Bul. 144.

More careful handling of the vines during the picking season is urged, for it was observed that in many tomato fields "careless picking and rough treatment of the plants so cut down the total salable product that the cash returns barely paid for the expense of growing and marketing." Finally, the opinion is expressed that it would be more profitable to plant smaller areas and to practice more intensive methods of culture than is the case at present.

From the more detailed description of methods of culture given in the bulletin the following brief statement of some of the more important points has been compiled: It is stated that the highest yields are being secured in Indiana on sandy loam soils which are well drained and comparatively rich in plant food. If the soil is in sod or contains considerable clay, it is usually best to plow rather deep in the late fall and disk every two weeks in the spring until the young plants are ready to be set out.

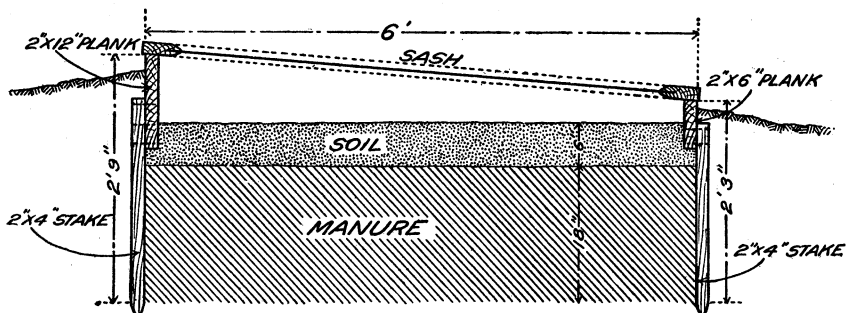


FIG. 2.—Section showing the construction of a hotbed for tomato plants.

Just before transplanting, the soil should be put into as fine tilth as possible. This can be done with from two to four thorough harrowings, the last one coming immediately before the plants are set in the field * * *. The depth of plowing should be 8 inches or even more if the subsoil is not too near the surface.

After the soil has been put in the best possible state of tilth, if it is deficient in plant food, it should be liberally fertilized with well-rotted barnyard manure, which may be supplemented with commercial fertilizers if the soil is not rich enough to give the plants a good start when set in the field.

One of the first considerations in producing strong, healthy plants is the securing of good seed. Such seed are usually furnished by the canning companies, but it is advisable to make germination tests of the seed before planting. Plants are grown in hotbeds, cold frames, or in seedbeds in the open ground.

The safest and surest way of growing tomato plants is by the use of hotbeds. These can be constructed of 2-inch planks nailed or bolted together in the form of a rectangular box, generally 6 feet wide and as long as desired. [Fig. 2.] The box should be so made that when the bottom is level, the sash will slope 1

inch to the foot, which will make it 6 inches higher on one side than on the other. This slope permits the sun's rays to enter more freely and allows water to run off quickly. The bed should be located on a southern slope if possible and run east and west, with the lower side of the frame toward the south. If a southern exposure can not be secured, a windbreak may be constructed on the north side and the ends to shut off the cold winds from these directions. The beds should also be near the house and near a plentiful supply of water in order that the plants may be carefully and easily cared for.

Common stable horse manure containing no litter, mixed with from one-third to one-half its amount of straw or leaves, is used for providing the artificial heat. Straw or leaves should be added to prolong the heating period of the manure and to keep it from heating too violently. The manure is gathered fresh from the stable, piled up, and allowed to heat. When heated through it is forked over and allowed to heat again. During the heating it should be kept under shelter, as heavy drenchings make it almost worthless. After it is well heated through the second time, it is put in the hotbed excavation almost to the sash level, care being taken to spread it evenly and to have the corners well filled. After the manure has again warmed up it should be firmed by tramping. The bed is now ready for the soil.

Five or six inches of rich soil containing much humus and sand are then placed upon the manure, and after the temperature of the soil has dropped to 90° F. the seed may be sown. A good soil for this purpose can be prepared by making a compost heap consisting of alternate layers of June grass sod and barnyard manure eight or ten months before it is to be used. This will give a loose, rich soil very well adapted to hotbed work.

The bed should be prepared early in the spring, so that the seed may be sown from the first to the middle of March, which will give plenty of time for the developing of good-sized plants. The seed should be sown thinly from one-fourth to one-half inch deep, and preferably in rows 4 to 6 inches apart, thus giving an opportunity for thinning and stirring the soil. Broadcast sowing, although not uncommon, is not to be recommended.

On warm days the bed should be ventilated to make the plants grow stocky and prevent them from wilting. Tomatoes thrive best at a temperature of from 75° to 85° during the day and about 60° at night. In watering the aim should be to water thoroughly, but not often. The practice of adding a small amount of water each day should never be followed, as it encourages the growth of insects and diseases, and benefits the plant but little, since the moisture does not reach the roots.

A week or ten days before the time to transplant into the field, or earlier, if the weather permits, the sash should be removed during the day to harden off the plants. It is also a good plan to stop watering at this time, and then wet down thoroughly just before taking to the field.

Different materials are used for covering hotbeds. A cheap and quite common one is light canvas or heavy sheeting which has been oiled. A more substantial covering is the hotbed sash, which is coming into use more and more, as it is more reliable than the cloth, and makes it possible to control the temperature with more certainty.

A cold frame differs from a hotbed in that no artificial heat is used. They are usually started and the seed sown the last of March or first of April. Otherwise their construction and care is the same as that given above for hotbeds.

The growth of plants in seedbeds in the open ground is not considered satisfactory in the latitude of Indiana.

The young plants are set in the field as soon as possible after danger of frost is past, usually from May 15 to June 10, in Indiana. The best time for transplanting is on cloudy days, when the soil is moist, or in the mornings and evenings if the days are warm and sunshiny. The depth of setting varies with the size of the plants. If they are short and stocky 4 to 6 inches is sufficient, but if the stems are long they may be set even a foot deep without injury, if the subsoil permits. The plants should be set at distances of from 4 by 5 to 5 by 5 feet with the varieties that are now being grown for canning purposes. As soon as possible after the plants have been set in the field they should be cultivated, and the first cultivation may be rather deep and close to the plants, the shovels of the cultivator being set to throw the dirt slightly toward them. Shallow cultivation farther away from the plants should follow at intervals of from 7 to 10 days. Cultivation should cease, as a rule, when the first fruits are beginning to set on the vines.

If the plants are still small they may be cultivated once between each row, care being taken not to shake the vines, which causes the small fruit to drop. Plants properly cared for will usually cover a considerable portion of the ground when the fruits begin to form, thus preventing evaporation to a great extent. Throughout the remainder of the season, two or three thorough hoeings will generally be sufficient to keep the weeds under control.

The tool commonly used in caring for the crop is the two-horse corn cultivator. One of these should be selected with several small teeth to break the soil in preference to those having two large shovels, which leave the soil in ridges. Level and shallow cultivation is preferable to hilling or ridging.

The time of harvesting depends to a large extent on the time of transplanting and the weather conditions when the first fruits are setting. Under favorable conditions the first picking occurs about 80 days after the plants are set in the field. As already indicated, care should be taken in removing the fruits not to move the vines more than is absolutely necessary.

The favorite variety throughout the tomato-growing section of Indiana is the Stone, although this variety is not considered ideal for the purpose. A good type of tomato for canning purposes should possess the following characteristics:

- (1) Fruit smooth, without ridges and without a depression at the stem end;
- (2) interior firm and well formed;
- (3) vine an upright grower, with strong stems;
- (4) plant producing a large weight of fruit throughout the season;
- (5) uniform red color, which remains bright during preserving processes.

The tomato is subject to attacks of various insect pests and diseases, among which are the tomato worm, which can be controlled by the use of sprays of Paris green and arsenate of lead or by hand picking; cutworms, which may be controlled to some extent by plowing the soil two weeks before transplanting and by the use of poisoned baits; the stalk borer, which may be controlled to some extent by the pre-

ventive measures of keeping the field free from weeds and foreign plants and practicing a rotation of crops; point rot, for which there is at present no effective means of control; ripe rot or anthracnose, the injury from which may be reduced by destroying diseased fruits and planting far enough apart to admit light and air into the plants; and leaf-spot diseases, the standard remedy for which is spraying with Bordeaux mixture.

It is stated that with proper care and a good season without exceptional losses from insects and diseases yields may be expected to run from 6 to 12 tons per acre in Indiana. The opinion is expressed that the yield could easily be raised to 12 or 15 tons per acre by following the improved methods suggested. Roughly speaking, it requires a yield of at least 5 tons per acre to pay expenses at the usual contract prices. The cost of growing depends largely upon the methods followed. Estimates of reliable growers place it at from \$25 to \$50 per acre. Probably \$35 may be considered a fair estimate. The price received for the crop varies from \$7 to \$8.50 per ton. It thus appears that under the best conditions a profit of from \$50 to \$75 per acre may be realized. If, however, "the crop does not receive the care and attention that it should, the profits are often very small, and in some cases the grower does not get any more out of his crop than the cost of producing it."

The whole subject of tomato culture, including growing for canneries, is treated by L. C. Corbett in a Farmers' Bulletin of this Department,^a the purpose of this article being to call particular attention to certain points which have been found to be neglected in practice.

LIME SULPHUR AS A FUNGICIDE.^b

The use of some form of lime sulphur as a substitute for Bordeaux mixture in combating fungus diseases of the orchard is at the present time of great interest to fruit growers, as is evidenced by the constant demand for definite and reliable data on the fungicidal value of the various lime-sulphur mixtures.

Some form of powdered sulphur has been used for years by the French vineyardists in combating the grape oïdium, a fungus disease which often causes serious losses to European vine growers. On the

^a U. S. Dept. Agr., Farmers' Bul. 220.

^b Compiled from Delaware Sta. Bul. 85; Maryland Sta. Bul. 143; Michigan Sta. Bul. 49; New York Cornell Sta. Bul. 276; New York State Sta. Bul. 320; Oregon Sta. Bul. 106; Pennsylvania Sta. Bul. 92; Tennessee Sta. Bul. 88; Virginia Sta. Bul. 188; U. S. Dept. Agr., Bur. Plant Indus. Buls. 155, 174; Circs. 27, 54, 58; The summer use of concentrated lime sulphur, by H. H. Whetzel: Reprint from Proc. N. Y. State Fruit Growers' Assoc., 9 (1910), pp. 31-44; Rev. Vit., 33 (1910), No. 862, pp. 691, 692; Jour. Bd. Agr. [London], 17 (1910), No. 3, pp. 184-189; Fruit-Grower, 20 (1909), No. 1, pp. 6, 7.

Pacific slope home-boiled lime-sulphur preparations have been used for a number of years in fighting the San José scale, but only in recent years has the use of lime sulphur as a general fungicide been considered and experiments carried out on a large scale to determine the efficiency of the various lime-sulphur mixtures in controlling fungus diseases, especially of the orchard.

The standard fungicide is Bordeaux mixture, but this spray on certain varieties of trees and under certain weather conditions often russets the fruit or causes serious damage to the foliage, especially when used during the summer. This is the case with many varieties of stone fruits, notably the peach. For this reason there is a demand for a spray that can be used on the foliage of these more sensitive trees without injury, and yet control the prevalent and injurious fungus diseases to which they are subject.

There are three types of lime-sulphur sprays, as follows: Self-boiled lime-sulphur mixture, home-boiled lime-sulphur wash, and factory-boiled lime-sulphur solution, or concentrated lime sulphur, as it is usually known.

The self-boiled lime-sulphur mixture of Scott, which was developed primarily for spraying peach trees, is the spray commonly meant when speaking of the self-boiled lime-sulphur preparations. It is made by using 8 pounds of fresh stone lime and 8 pounds of sulphur—either flowers or flour of sulphur—to 50 gallons of water, commonly designated as an 8:8:50 mixture, or the strength may vary from 6:6:50 to 10:10:50, governed by the time of year it is to be applied, the kind of fruit trees to be sprayed, and the fungus to be controlled. The mixture can best be prepared in rather large quantities, say, enough for 200 gallons at a time, making the formula 32 pounds of lime and 32 pounds of sulphur to be cooked with a small quantity of water—8 or 10 gallons—and then diluted to 200 gallons. The lime should be placed in a barrel and enough water poured on to almost cover it. As soon as the lime begins to slake the sulphur should be added, after first running it through a sieve to take out the lumps. The mixture should be constantly stirred and more water added as needed to form a thick paste at first, and then gradually a thin paste. The lime will supply enough heat to boil the mixture several minutes. When well slaked, water should be added to cool the mixture and prevent further cooking. It is then ready to be strained into the spray tank, diluted, and applied. Care must be taken not to allow the boiling to proceed too far, as some of the sulphur will then go into solution, forming sulphids, which are injurious to the foliage. The intense heat, violent boiling, and constant stirring results in a uniform mixture of finely-divided sulphur and lime, with only a very small percentage of the sulphur in solution. This mixture should be applied immediately after it is made

with a good spraying outfit equipped with an agitator, Vermorel nozzles, etc.

The home-boiled concentrated lime-sulphur solution—Cordley's—is prepared as follows: Sulphur, 110 pounds; good stone lime, 25 pounds. Slake the lime in a kettle, making a paste of the sulphur with a little water, add the sulphur paste to the slaked lime, and add water to make 60 gallons. Boil 30 to 40 minutes. Allow to settle, and then pour off the clear, amber liquid, of which there should be approximately 45 gallons, testing 30° by the Baumé hydrometer. This concentrated stock solution is then diluted to 1:12, 1:30, etc., according to the season of the year and the trees to be sprayed.

The commercial lime-sulphur concentrated solutions were first devised as a substitute for the ordinary home-boiled lime-sulphur preparations used for San José scale. Several of these brands on the market have been tested by reliable experimenters in the United States for the control of certain orchard diseases. These concentrated lime-sulphur mixtures must be diluted before using as fungicides.

Of the three types of lime-sulphur preparations, the so-called self-boiled lime-sulphur spray of Scott has probably been the most widely and thoroughly tested by reliable investigators and orchardists as to its fungicidal value in combating the various orchard diseases. W. M. Scott, of the Bureau of Plant Industry, has been especially active in the past three years in testing its efficacy as a substitute for Bordeaux mixture on fruit trees where the Bordeaux spray would injure the fruit or the foliage. These experiments have included tests on peach brown rot, peach scab, cherry leaf spot, apple scab, apple leaf spot, sooty mold, bitter rot, and apple blotch, in many States, and with various varieties of peaches and apples. The efficiency of the self-boiled mixture in controlling the peach brown rot and peach scab has been tested in Georgia, Arkansas, West Virginia, Delaware, Maryland, Tennessee, and Illinois, and in the majority of cases has proved very successful, especially in Georgia, Arkansas, West Virginia, and Illinois, where the peach trees were sprayed three to four times with an 8:8:50 solution, to which 2 pounds of arsenate of lead was added when the curculio was bad.

In addition to controlling the brown rot and the scab without injury to the foliage, the fruit sprayed with the self-boiled lime-sulphur was larger, more highly colored, presented a much better appearance in the package, carried to market better, and commanded a higher price than the unsprayed fruit. However, there is some danger of staining the fruit if the mixture is applied within two or three weeks of the ripening period.

Very satisfactory results were obtained with this mixture in controlling the cherry leaf spot and leaf diseases in general of the peach

and cherry. On varieties of apples subject to russetting and foliage injury from Bordeaux mixture, the self-boiled lime-sulphur preparation has proved a good substitute for controlling leaf spot, fruit spot, sooty fungus, and for mild cases of scab infection, without injury to the fruit or foliage, but is of doubtful value in controlling apple blotch and bitter rot. Two pounds of arsenate of lead added to every 50 gallons of the self-boiled mixture proved of value in controlling the codling moth and was entirely harmless to the apple foliage.

The self-boiled lime-sulphur mixture seems, therefore, to be of value, especially as a summer spray for the fungus diseases of the peach and cherry and for several diseases of the apple, and does not injure the foliage nor fruit when properly prepared and applied. It has not proved efficient in this country against black rot of the grape, although a modified self-boiled lime-sulphur mixture consisting of 2 pounds of sulphur, 1 pound of lime, and 2 pounds of copper sulphate, diluted to 1 and $1\frac{1}{2}$ per cent solutions, is reported by a French vineyardist as having given complete protection to his vineyard of 30,000 plants against the grape oïdium for the past 10 years. A somewhat similar spray has recently been tested by M. B. Waite, of the Bureau of Plant Industry, on the apple with success against fungus diseases, but with some russetting and foliage injury to certain varieties.

The self-boiled lime-sulphur mixture has also been tested on tomatoes, cabbages, onions, strawberries, peas, celery, sweet potatoes, asparagus, and cantaloups, chiefly to ascertain whether injurious effects would ensue. With the exception of the cantaloups, no damage was noted on the plants sprayed, and slight if any benefit was derived in the prevention or control of diseases.

The home-boiled and commercial lime-sulphur sprays are preparations in which much of the sulphur has chemically combined with the lime, forming various sulphids, some of which are very injurious to the foliage of grapes, peaches, and apples, but with the proper dilution both have proved valuable fungicides in controlling certain diseases. The commercial lime-sulphur spray has proved very effective against peach leaf curl and apple scab, but fruit subject to bitter rot must be treated with a stronger fungicide. The dilution of the self-boiled and commercial mixtures varies with the time of application, variety of tree, and the disease. In some instances serious injury to foliage has followed the application of too concentrated solutions, especially of the commercial preparations. Arsenate of lead may be used with either preparation without any additional risk of foliage injury.

In general, then, it would seem that the self-boiled lime-sulphur mixture is the best for the peach, and either the commercial or the home-boiled solution for the apple. The home-boiled mixture has also been tested in England on the hop mildew, gooseberry mildew, and apple scab, where it was very efficacious in combating the

hop mildew, and is recommended for trial against powdery mildews and apple scab.

For details as to number of applications, dilutions to be used, methods of preparation, etc., see list of bulletins from which this compilation was made on page 12, especially Bureau of Plant Industry Bulletin 174 and Circulars 27 and 54.

MARKET CLASSES AND GRADES OF MEAT.^a

The importance of a knowledge of the standard requirements of the meat market on the part of the producer is pointed out by L. D. Hall in a bulletin of the Illinois Station dealing in a very comprehensive way with the market classes and grades of meat.

Breeders, feeders, or investigators who consider only the cost of production and the market value of the live animal, ignoring the demands of the meat trade, overlook one of the most important factors that affect the live-stock market and may thus fail to follow the most rational lines of improvement in breeding and feeding. * * * With an understanding of meat-trade requirements it is possible for a stockman to judge the carcass yield and quality of his animals as intelligently as buyers at the stockyards; because his knowledge of the feeds used, length of feeding period, and gains made are as essential in making such estimates as the apparent form, condition, and quality of the fat animal, upon which points the buyer must chiefly rely.

The descriptions presented below are based on data secured in an investigation at wholesale meat markets at the Union Stock Yards, Chicago, and also at prominent wholesale and retail markets in Chicago and other cities which are supplied from the large houses at the Union Stock Yards, and may be considered standard for all the great packing centers of this country; and since most American wholesale markets are supplied from these centers, the classification may be regarded as standard for the country. It should be borne in mind that the classifications are those of the wholesale meat trade and not of the live-stock market, and that the weights given refer to dressed carcasses and cuts, and in no case to live animals.

BEEF.

1. Carcass beef.—This includes both full sides and quarters (fig. 3). The classes are steers, heifers, cows, and bulls and stags. The classes differ not only in sex, but also in the uses to which they are adapted.

The grades within the classes are prime, choice, good, medium, common, and canners. The grades are based on differences in form, thickness, finish, quality, soundness, and weight.

"Native" carcass beef has sufficient finish to indicate grain feeding, is comparatively compact in form, thickly fleshed, mature in proportion to age, and consists chiefly of medium to prime steers, heifers, and cows of the heavier weights. "Westerns" are relatively "rangy" in form, "grassy" in color and general appearance, coarser in quality and inferior to "natives" in finish, consisting largely of common to good cows and steers. "Texas" beeves are

^a Compiled from Illinois Sta. Bul. 147, Abstract.

light-weight carcasses, inferior to "Westerns" in form, finish, and quality, usually bruised and showing considerable age, consisting chiefly of medium, common, and canner cows and steers. These terms have much less geographical significance than formerly.

"Yearlings" are carcasses of young steers and heifers of 400 to 700 pounds dressed weight, with sufficient quality and finish to be sold at retail on the butcher's block. "Butcher cattle" are those especially adapted to "butcher-shop" trade and consist principally of medium to choice heifers, steers, and cows. "Kosher" cattle are beeves that have been slaughtered, inspected, cleansed, and labeled in accordance with Jewish rites, and include medium to choice steers, cows, and heifers. "Distillers" are steers, bulls, and stags that have soft, "washy" flesh and "high color," characteristic of cattle fattened on distillery slops. They are principally of medium and good grades.

"Shipping beef" refers to that sent to Eastern cities and consists chiefly of steers, heifers and cows of medium to prime grades. "Export beef" is made up mainly of medium to choice steers, and includes good and choice heifers, heavy cows, bulls, and stags.

2. Beef cuts.—The "straight cuts" are loins, ribs, rounds, chucks, plates, flanks, and shanks (fig. 3).

The grades of beef cuts are No. 1, No. 2, No. 3, and strippers. The grade of a cut depends upon its thickness, covering, quality, and weight.

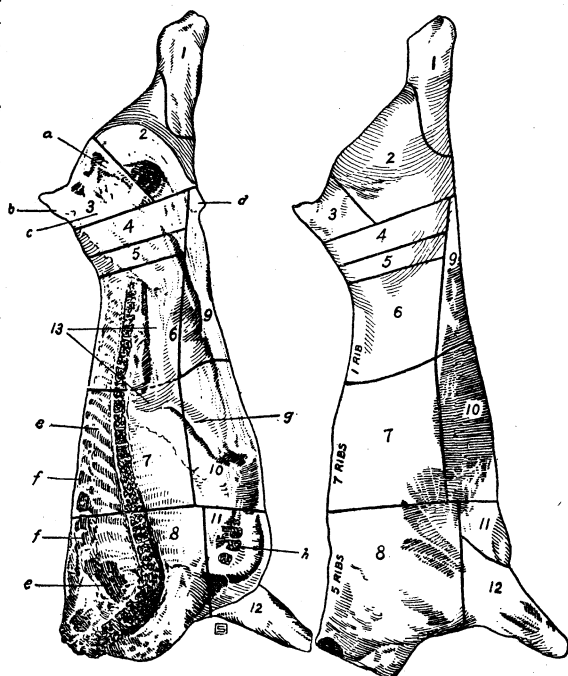


FIG. 3.—Cuts of beef: 1, 2, 3, round; 4, 5, 6, loin; 7, rib; 8, chuck; 9, flank; 10, 11, plate; 12, shank; 13, suet; 1, hind shank; 2, round (rump and hind shank off); 3, rump; 4, 5, loin end; 6, pinbone loin; 5, 6, flatbone loin; 10, navel; 11, brisket; 1, 2, 3, 4, 5, 6, 9, hind quarter; 7, 8, 10, 11, 12, fore quarter; 7, 8, back; 7, 10, piece; 8, 11, 12, Kosher chuck; 8, 10, 11, 12, triangle; a, aitch-bone; b, rump-bone; c, crotch; d, cod; e, chine-bones; f, "buttons;" g, skirt; h, breast-bone.

Percentage of "straight" beef cuts to carcass weight.

Cuts.	Loins.	Ribs.	Round.	Chucks.	Plates.	Flanks.	Shanks.	Suet.
Extreme.....	15-19	8-11	20-26	21-27	12-16	2-5	3-7	2-7
Conventional.....	17	9	23	26	13	4	4	4

Various other wholesale cuts are made from the "straight" cuts, and in general are graded in a similar manner (fig. 3).

3. Cured beef products.—These are (1) barreled, (2) smoked, and (3) canned beef.

Barreled beef is packed in brine. The standard grades are extra India mess, extra plate, regular plate, packet, common plate, rolled boneless, prime mess, extra mess, rump butt and mess chuck beef, beef hams, and Scotch buttocks.

Smoked beef is cured in sweet pickle, dried, and smoked. It consists of dried beef hams, dried beef clods, and smoked brisket beef.

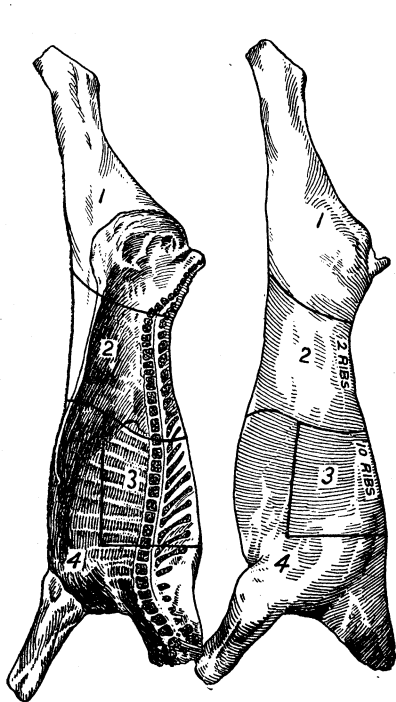


FIG. 4.—Cuts of veal: 1, 2, saddle (or 2 hind quarters); 3, 4, rack (or 2 fore quarters); 1, leg; 2, loin; 3, ribs; 4, stew.

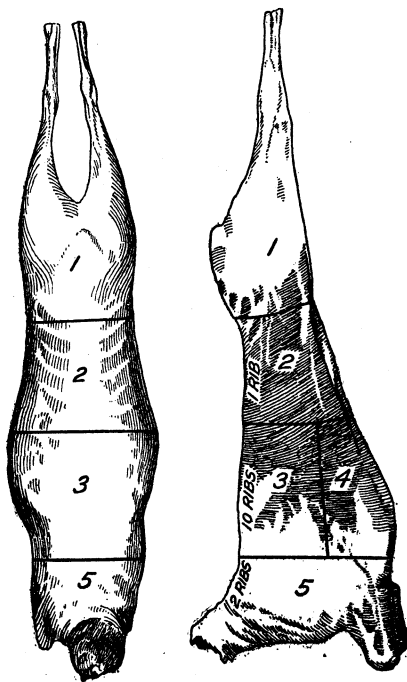


FIG. 5.—Cuts of mutton and lamb: 1, 2, saddle; 3, 4, 5, rack; 1, 2, 3, long saddle; 2, 3, 4, 5, body; 1, leg; 2, loin; 3, short rack; 2, 3, back; 4, breast; 5, chuck; 4, 5, stew.

Canned beef is sealed in tins or glass jars, usually after partial curing and cooking. It consists principally of chipped beef, beef loaf, corned beef, and roast beef.

VEAL.

1. Carcass veal.—This consists of whole carcasses, which are usually sold with the skin on.

The grades are choice, good, medium, light, and heavy. The grade of a carcass is determined by its form, quality, finish, and weight.

"Native" calves have white, fine-grained flesh and long, soft hair. "Westerns" have comparatively coarse, dark-colored flesh, "rangy" form, and short, straight hair.

2. Veal cuts.—The regular cuts are saddles and racks. Each is about one-half, by weight, of the skinned carcass (fig. 4). They are graded as choice, good, medium, and common, according to the same factors as carcass veal.

Subdivisions of the regular cuts are made in some markets, and similarly graded (fig. 4). Veal legs and stews each contain about one-third the carcass weight; ribs and loins about one-sixth each.

MUTTON AND LAMB.

1. Carcass mutton and lamb.—The classes are wethers, ewes, bucks, yearlings, and lambs. The classification is based on differences in sex and degree of maturity.

The grades within the classes are choice, good, medium, common, and culls. The grade of a carcass is determined by its form, quality, covering, and weight.

The shipping trade goes principally to cities in the eastern seaboard States and consists largely of medium to choice lambs.

2. Mutton and lamb cuts.—Saddles and racks are the cuts most commonly made; but legs, loins, short racks, stews, and backs are also quite extensively sold (fig. 5). These cuts are graded as choice, good, medium, and common, according to their shape, quality, covering, and weight. In relative weights, the various cuts are similar to the corresponding cuts of veal.

PORK.

1. Dressed hogs.—The classes are smooth heavy, butcher, packing, and bacon hogs, shippers, and pigs. The classification is based on the uses to which the hogs are adapted.

Distinct grades are recognized only in the packing and bacon classes, the former being based on weight and the latter chiefly on quality and finish.

2. Pork cuts.—The classes are hams, sides, bellies, backs, loins, shoulders, butts and plates, and miscellaneous, these being determined by the parts of the carcass from which they are made (fig. 6).

The grades and methods of grading vary widely in the different classes of cuts, and involve not only their quality, shape, finish, and weight, but also the styles of cutting and methods of packing used.

Pork cuts are quoted as fresh pork, dry-salt, and bacon meats, barreled or plain-pickled pork, sweet-pickled meats, smoked meats, "English" meats, and boiled meats, respectively.

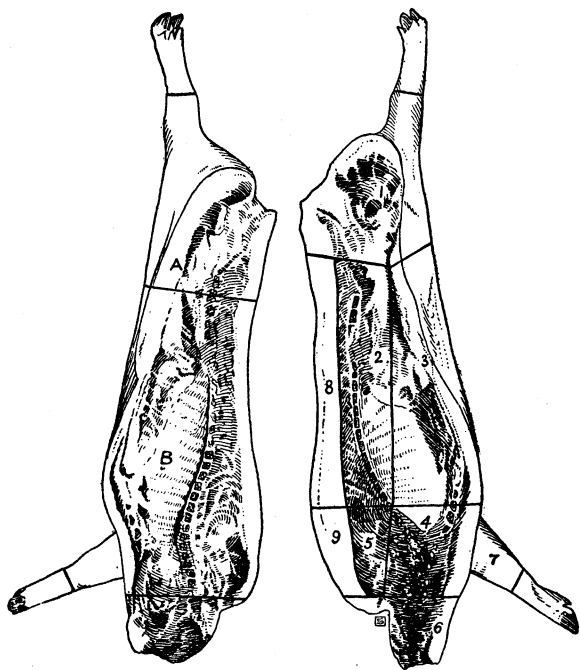


FIG. 6.—Cuts of pork: English cuts—A, long-cut ham; B, long side or middle. Domestic cuts—1, short-cut ham; 2, loin; 3, belly; 4, picnic butt; 5, Boston butt; 6, jowl; 7, hock; 8, fat back; 9, clear plate; 2, 8, back; 2, 3, 8, side; 4, 7, picnic shoulder; 5, 9, shoulder butt; 8, 9, long fat back; 4, 5, 7, 9, rough shoulder.

3. **Lard.**—The grades are kettle-rendered leaf, kettle-rendered, neutral, prime steam, refined, and compound lard. The grading is based on the kinds of fats included, method of rendering, color, flavor, and grain.

KEEPING POULTRY FREE FROM LICE.^a

As pointed out in a bulletin of the Maine Experiment Station by Raymond Pearl and Frank M. Surface, "one of the most difficult and trying problems which the poultry keeper has to meet is that of keeping his poultry houses and stock reasonably free from lice, mites, and other external parasites."

After testing various proprietary preparations and finding most of them very expensive in proportion to their efficiency the station adopted the use of preparations based upon formulas proposed by R. C. Lawry, of the New York Cornell Experiment Station, with very satisfactory results.

For the birds themselves experience has shown that the best way to get rid of the lice is by the use of a dusting powder to be worked into the feathers. In using any kind of lice powder on poultry * * * it should always be remembered that a single application of powder is not sufficient. When there are lice present on a bird, there are always unhatched eggs of lice ("nits") present, too. The proper procedure is to follow up a first application of powder with a second at an interval of four days to a week. If the birds are badly infested at the beginning, it may be necessary to make still a third application. To clean the cracks and crevices of the woodwork of houses and nests of lice and vermin, a liquid spray or paint is probably the most desirable form of application.

The lice powder used is prepared by mixing three parts of gasoline with one part of crude carbolic acid, 90–95 per cent strength, or, if the latter can not be obtained, with one part of cresol, and adding gradually, with stirring, enough plaster of Paris to make when the liquid is uniformly distributed through the mass of plaster a dry, pinkish-brown powder having a fairly strong carbolic odor and a rather less pronounced gasoline odor. As a general rule, it will take about 4 quarts of plaster of Paris to 1 quart of the liquid.

This powder is to be worked into the feathers of the birds affected with vermin. The bulk of the application should be in the fluff around the vent and on the ventral side of the body and in the fluff under the wings. * * *

For a spray or paint to be applied to roosting boards, nest boxes, or walls and floor of the hen houses the following preparation is used: Three parts of kerosene and 1 part crude carbolic acid, 90–95 per cent strength. This is stirred up when used and may be applied with any of the hand spray pumps or with a brush. If 90–95 per cent crude carbolic acid can not be obtained, cresol may be substituted for it in this paint.

The routine methods used by the station are as follows:

All hatching and rearing of chickens is done in incubators and brooders. The growing chickens are never allowed to come into any contact whatever with old

^a Compiled from Maine Sta. Bul. 179, p. 78.

hens. Therefore, when the pullets are ready to go into the laying houses in the fall they are free from lice. Sometime in the late summer, usually in August or early in September, the laying houses are given a thorough cleaning. They are first scraped, scoured, and washed out with water thrown on the walls and floor with as much pressure as possible from a hose. They are then given two thorough sprayings, with an interval of several days intervening, with a solution of cresol^a * * *. Then the roosting boards, nests, floors, and walls to a height of about 5 feet are thoroughly sprayed with the lice paint (kerosene oil and crude carbolic acid described above). Finally, any yearlings, or older birds, whether male or female, which are to be kept over for the next year's work are given two or three successive dustings, at intervals of several days to a week between each application, with the lice powder described above before they are put into the clean houses.

As a result of these methods, the station's poultry plant is at all times of the year practically free of lice.

NEUFCHATEL CHEESE.^b

The soft-curd rennet cheese known as Neufchatel, made extensively in the Department of Seine-Inférieure, France, from cow's milk, either whole or skimmed, has become very popular in the United States, but in this country the process of manufacture has been considerably changed, so that as now made it represents a different type and is ready for use as soon as made, whereas the French variety is allowed to ripen for several weeks. A recent Cornell bulletin describes the process of manufacture as now practiced in both countries.

Foreign method of manufacture.—Fresh milk is set at 85° F., with sufficient rennet to cause a thorough coagulation in twenty-four to thirty-six hours. The curd is then placed in cheesecloth bags and allowed to drain for some twelve to twenty-four hours. The draining is assisted by the application of light pressure. When the curd is dry enough it is pressed into cylindrical shapes 1½ by 3 inches, and salted from the outside. It is then allowed to drain for several hours and is placed in a ripening room, where in a few weeks it becomes covered with white

^a This cresol solution is prepared as follows: Measure out 3½ quarts of raw linseed oil in a 4 or 5 gallon stone crock; then weigh out in a dish 1 pound 6 ounces of commercial lye or "Babbit's potash." Dissolve this lye in as little water as will completely dissolve it. Start with one-half pint of water, and if this will not dissolve all the lye add more water slowly. Let this stand for at least three hours until the lye is completely dissolved and the solution is cold; then add the cold lye solution very slowly to the linseed oil, stirring constantly. Not less than five minutes should be taken for the adding of this solution of lye to the oil. After the lye is added continue the stirring until the mixture is in the condition and has the texture of a smooth, homogeneous liquid soap. This ought not to take more than a half hour. Then while the soap is in this liquid state and before it has a chance to harden add, with constant stirring, 8½ quarts of commercial cresol. The cresol will blend perfectly with the soap solution and make a clear, dark-brown fluid. The resulting solution of cresol soap is then ready to use. This cresol soap will mix in any proportion with water and yield a clear solution.

^b Compiled from New York Cornell Sta. Bul. 270; North Carolina Sta. Bul. 210.

and blue mold. The cheese is then placed in a cellar for further ripening, and when red spots appear on the outside it is wrapped in paper and tinfoil and marketed.

American method of manufacture.—Fresh sweet milk is heated to 165° F. for ten minutes and then cooled immediately to 72° F. Until very recently, the milk used was not pasteurized, but the great difficulty in securing reliable milk, together with the advantages of pasteurization and the use of a commercial starter, have made the heating method very popular.

In large factories the cheese is made in large vats, but on the farm it can be made in smaller quantities in shotgun cans holding about 30 pounds of milk. After the milk is cooled to 72° F., a small amount of commercial starter is added and enough rennet to insure a thorough coagulation in eighteen hours. Usually about 1 cubic centimeter of commercial starter and $\frac{1}{4}$ cubic centimeter of rennet extract is sufficient to 30 pounds of milk if the temperature is maintained at 72° F. As soon as the milk is firmly coagulated it is placed on a cotton-covered strainer rack or in cotton bags to drain. The acidity of the exuding whey at this time should be not over 0.3 per cent or the flavor of the cheese will be too acid. The draining process requires several hours and should be kept up until all free whey has escaped. Light pressure, such as can be obtained in a small cheese press, aids materially in expelling the whey. During the draining process the curd on the outer surface of the strainer should be stirred occasionally to insure even drying. As soon as the curd is sufficiently dry, salt is added at the rate of 2½ ounces to 10 pounds of curd. At this time the acidity of the whey should be not over 0.5 per cent. The cheese should then be pressed for a short time to expel excess whey. It is then kneaded by hand and finally pressed into small cylindrical shapes 1½ by 2½ inches, weighing one-fourth pound each. These are wrapped in parchment paper and tinfoil, and are then ready for market.

Qualities of Neufchatel cheese.—Neufchatel cheese should have a distinct, mild, clean flavor resembling well-ripened cream. The texture should be fairly dry, yet smooth and entirely free from lumps. There should be no leaking whey, and each cheese should be neatly wrapped. The cheese will usually keep in good condition for two weeks if kept in a cold place. From 100 pounds of milk about 22 pounds of Neufchatel cheese can be made, which sells for 20 to 40 cents per pound, depending on its quality and the manner of marketing.

Precautions to observe in making Neufchatel cheese.—The making of Neufchatel cheese is easy and very profitable, but in order to secure a uniformly good product each day strict attention must be given to the control of temperature, acidity, and moisture. High temperature, too much rennet, too much acid, too rapid drying and uneven drying, all cause lumpy texture. It is very important that the curd be properly coagulated before being placed in the draining process. If it is too soft, or breaks up too much in being transferred from the can to the strainer, uneven drying usually results.

J. Michels, of the North Carolina Station, states that American methods of making Neufchatel cheese are unsatisfactory because they are too slow, the souring process is not properly controlled with a consequent lack of uniformity of product, and the product is not properly packed. A method of procedure which he found was not subject to these objections is as follows:

Whole milk reenforced with an amount of cream equal to about one-quarter that in the whole milk makes the best Neufchatel cheese. However, whole milk

without the addition of cream will make a very satisfactory cheese. It is of first importance to use only milk which is clean and free from taints.

When the cheese is made on a small scale, common cans of the shotgun style will answer for handling the milk. Where several hundred pounds of milk are used a small milk or cream vat may be used. A strainer with perforated sides and bottom is also needed to drain the curd. * * *

The milk should be treated with a large amount of starter or pure culture of lactic-acid bacteria. On an average, 1 pound of starter to 4 pounds of milk will give best results. During warm weather when the milk has already ripened somewhat, and when there naturally is a more rapid development of lactic acid, one part of starter to five of milk will be about right. On the other hand, during cold weather or when the milk is very sweet, it is best to use at the rate of one part starter to three parts of milk. Thoroughly beat or shake the starter and strain it through one thickness of cheesecloth before adding it to the milk.

As soon as the starter has been added, heat the milk to 80° F. and add at the rate of 2½ ounces of commercial rennet extract per 1,000 pounds of milk. The rennet extract should be diluted with water to the extent of about eight times its own volume and then thoroughly mixed with the milk. The mixing should not be continued for more than three minutes. This precaution is necessary, as the milk begins to thicken in about five minutes. Cover the milk and allow it to stand quietly for 30 to 60 minutes, according to the amount of starter used. The more starter used the quicker the milk will curdle.

While the milk will usually be ready to cut in from 30 to 60 minutes, it is best to determine when this point is reached, as for Cheddar cheese, by breaking the curd with the forefinger. If the whey in the break is clear, the curd is ready to cut; if milky, the curdling has not progressed far enough. In general, the curd should be somewhat firmer than for Cheddar cheese before cutting.

Where much cheese is made, the curd is cut with special knives used with Cheddar cheese. The cutting in this case is done as follows: First cut the curd in horizontal layers with the horizontal knife; next cut lengthwise, and then crosswise with a perpendicular knife. This will make cubes about one-half inch on a side. Where small quantities of cheese are made any kind of a knife may be used to cut the curd. The smaller the amount of milk used, the coarser the curd should be cut.

As soon as the curd is cut it is carefully poured into a tin strainer lined with one thickness of cheesecloth. Both the sides and bottom of the strainer should be perforated. It should be about 10 inches deep and of such width and length as to permit filling it the full depth. Allow the curd to drain undisturbed for about one hour and then put a cover, preferably a metallic one, on it and add pressure at the rate of 1 pound for every gallon of milk used. During the next hour gradually increase this pressure until 5 pounds are used for every gallon of milk. Continue this amount of pressure for eight hours and then reduce to 2 pounds for every gallon of milk and keep at this pressure 12 hours longer, when the curd is ready to salt.

Salt at the rate of about 1 ounce of salt to 6 pounds of cheese. The salt can be evenly distributed during the mashing process.

With a heavy masher, similar to a potato masher, thoroughly mash the curd to a smooth consistency, leaving no unbroken particles or lumps. The smoother the curd the richer it will appear and the better it will taste.

A variety of packages may be used in which to pack the cheese. The common method of packing is to wrap the cheese first in parchment paper and then in

tin foil. This method of packing is especially suitable where cheese is made on a small scale. Such a package is open to the objection, however, that it does not sufficiently exclude the air to prevent molding.

The best package is one in which the cheese can be kept as nearly air tight as possible. We have found a tin-capped tumbler the most satisfactory. The only objection to the tumbler is the expense when purchased in small quantities. In large quantities 8-ounce tumblers may be purchased very cheaply.

The tumblers and the parchment caps which are put under the tin caps should be sterilized in boiling water before using. With a large spoon pack the tumbler brimful, place a parchment paper cap on top, and then cover with the tin cap. The parchment cap should project about one-quarter inch over the edge of the tumbler. Cheese packed in this way will keep 10 days during warm weather without refrigeration.

In making Neufchatel cheese as herein described a good starter is indispensable. It will pay well to give the starter careful attention. Use attractive labels on the tumblers. They cost little, but will help sell the cheese at a better price. While the cheese can be kept some time without refrigeration, it is best to keep it in as cool a place as possible, such as a cellar.

Prof. Michels thinks that Neufchatel cheese packed in 8-ounce tumblers should readily sell at 10 cents per tumbler net, and at this price will yield a good return to the producer and furnish the consumer a wholesome and digestible food at a very reasonable cost. One hundred pounds of milk containing 4 per cent of fat will yield thirty-four 8-ounce tumblers of cheese. When such milk is reenforced with cream as suggested above, 100 pounds of it will yield 38 tumblers of cheese.

[A list giving the titles of all Farmers' Bulletins available for distribution will be sent free upon application to any Member of Congress or the Secretary of Agriculture.]